Claims

What is claimed is:

- 1. A method for evaluating the performance of cellular network handoff decisions comprising the steps of:
 - a) creating a reference cellular network description, said reference cellular network description describing:
 - i) a cellular network geometry;
 - ii) a signal propagation description;
 - iii) at least two base stations, each of said at least two base stations having:
 - (1) a location within said cellular network geometry; and
 - (2) a pilot signal having a pilot signal strength; and
 - iv) at least one mobile unit capable of:
 - (1) moving along a trajectory; and
 - (2) sampling said pilot signal strength; and
 - b) creating reduced geometric structures from said reference cellular network description;
 - c) representing a general trajectory for said mobile unit in said reference cellular network description;
 - d) approximating said general trajectory with a piecewise path having a multitude of handoff decision points;
 - e) selecting a handoff mechanism;
 - f) selecting handoff parameters;
 - g) creating a discrete-time formulation characterizing handoff behaviors; and

	h)	calculating at least one handoff performance metric along at least one said handoff			
		decision point.			
2.	Αı	A method according to claim 1, wherein at least one of said at least one handoff performance			
	me	tric includes:			
	a)	an assignment probability;			
	b)	a handoff probability;			
	c)	a mean number of handoff value;			
	d)	a crossover point;			
	e)	an outage probability;			
	f)	a macrodiversity degree; and			
	g)	an overall signaling load incurred by said handoff mechanism.			
3.	A	method according to claim 1, wherein said cellular network geometry includes at least one			
	of	the following:			
	a)	a hexagonal cell pattern;			
	b)	a diamond cell pattern;			
	c)	a square cell pattern;			
	d)	a rhombus cell pattern; and			
	e)	a star pattern.			

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4. A method according to claim 1, wherein said cellular network geometry includes cells mapped into at least one reduced geometric structure.

- 5. A method according to claim 4, wherein said cellular network geometry includes reduced geometric structures mapped into at least one minimum geometric structure.
- 6. A method according to claim 1, wherein said signal propagation description includes at least one of the following components:
 - a) a path loss component;
 - b) a shadow fading component; and
 - c) a fast fading component.
- 7. A method according to claim 1, wherein said piecewise path is a piecewise linear path.
- 8. A method according to claim 1, wherein said step of selecting a handoff mechanism includes selecting a hard handoff mechanism.
- 9. A method according to claim 1, wherein said step of selecting a handoff mechanism includes selecting a soft handoff mechanism.
- 10. A method according to claim 1, wherein said step of selecting a handoff mechanism considers at least one of the following:
 - a) assignment regions;
 - b) relative pilot signal strengths; and
 - c) relative processed signal strengths.

11. A method according to claim 1, wherein said handoff parameters include at least one of the				
following:				
a) a hysteresis value;				
b) a drop timer value;				
c) an averaging parameter; and				
d) a handoff decision interval.				
12. A method according to claim 1, wherein said step of calculating at least one handoff				
performance metric along at least one said handoff decision point uses a recursive procedure				
13. A cellular network handoff modeler comprising:				
a) a reference cellular network description generator, capable of generating a reference				
cellular network description, said reference cellular network description describing:				
i) a cellular network geometry;				
ii) a signal propagation description;				
iii) at least two base stations, each of said at least two base stations having:				
(1) a location within said cellular network geometry; and				
(2) a pilot signal having a pilot signal strength; and				
iv) at least one mobile unit capable of:				
(1) moving along a trajectory; and				

(2) sampling said pilot signal strength; and

- b) a reduced geometric structure creator, capable of creating reduced geometric structures from said reference cellular network description;
- c) a general trajectory generator, capable of representing a general trajectory for said mobile unit in said reference cellular network description;
- d) a piecewise path creator capable of approximating said general trajectory with a piecewise path having a multitude of handoff decision points;
- e) a handoff mechanism selector;
- f) handoff parameters selector;
- g) a discrete-time formulation creator capable of characterizing handoff behaviors; and
- h) a handoff performance metric calculator capable of calculating at least one handoff performance metric along at least one said handoff decision point.
- 14. A method according to claim 13, wherein at least one of said at least one handoff performance metric includes:
 - a) an assignment probability;
 - b) a handoff probability;
 - c) a mean number of handoff value;
 - d) a crossover point;
 - e) an outage probability;
 - f) a macrodiversity degree; and
 - g) an overall signaling load incurred by said handoff mechanism.

15. A method according to claim 13, wherein said cellular network geometry includes at least				
one of the following:				
a) a hexagonal cell pattern;				
b) a diamond cell pattern;				
c) a square cell pattern;				
d) a rhombus cell pattern; and				
e) a star pattern.				
16. A method according to claim 13, wherein said cellular network geometry includes cells				
mapped into at least one reduced geometric structure.				
17. A method according to claim 16, wherein said cellular network geometry includes reduced				
geometric structures mapped into at least one minimum geometric structure.				
18. A method according to claim 13, wherein said signal propagation description includes at least				
one of the following components:				
a) a path loss component;				
b) a shadow fading component; and				
c) a fast fading component.				
19. A method according to claim 13, wherein said piecewise path is a piecewise linear path.				

20. A method according to claim 13, when	ein said handoff mechanism selector is capable of
selecting a hard handoff mechanism.	

- 21. A method according to claim 13, wherein said handoff mechanism selector is capable of selecting a soft handoff mechanism.
- 22. A method according to claim 13, wherein said handoff mechanism selector considers at least one of the following:
 - a) assignment regions;
 - b) relative pilot signal strengths; and
 - c) relative processed signal strengths.
- 23. A method according to claim 13, wherein said handoff parameters include at least one of the following:
 - a) a hysteresis value;
 - b) a drop timer value;
 - c) an averaging parameter; and
 - d) a handoff decision interval.
- 24. A method according to claim 13, wherein said handoff performance metric calculator uses a recursive procedure.